

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : E04B 1/76, 1/78, E04C 2/24		A1	(11) International Publication Number: WO 94/29540 (43) International Publication Date: 22 December 1994 (22.12.94)
(21) International Application Number: PCT/US93/05328 (22) International Filing Date: 3 June 1993 (03.06.93)		(81) Designated States: AU, CA, JP, KR, PL, RU, UA, European patent (DE, ES, FR, GB, IT, SE).  Published <i>With international search report.</i>	
(71) Applicant: OWENS-CORNING FIBERGLAS CORPORATION [US/US]; Fiberglas Tower 26, Toledo, OH 43659 (US).  (72) Inventors: HALL, Herbert, L.; 1371 Pleasant Valley Road, Newark, OH 43055 (US). BERDAN, Clarke, II; 1878 Hankinson Road, Granville, OH 43023 (US). SCOTT, James, W.; 1738 Stonewall Drive, Newark, OH 43055 (US). WILLIAMS, Steven, H.; 3901 Worthington Road, Alexandria, OH 43001 (US). SCHELHORN, Jean, E.; 108 Edgewood Drive, Granville, OH 43023 (US).  (74) Agents: GILLESPIE, Ted, C. et al; Fiberglas Tower 26, Toledo, OH 43659 (US).			
(54) Title: INSULATION BATT WITH LOW FRICTION FACING			
(57) Abstract			
<p>A compressible mineral fiber insulation batt (10) has opposed major surfaces (12) and opposed side surfaces, and a polymeric facing (18) adhered with fastening means (20) to both of the major surfaces (12) to prevent relative movement between the facing (18) and the batt (10), where the facing (18) is less than or equal to 1.02E-5 meters (1 mil) in thickness and the facing (18) is sufficiently low mass as to exhibit a flame spread rating of 25 or less in the adhered condition.</p>			

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

DESCRIPTION

## 5           INSULATION BATT WITH LOW FRICTION FACING

## TECHNICAL FIELD

This invention pertains to mineral fiber insulation products. More particularly, this invention relates to mineral fiber insulation batts having a facing adhered thereto.

10           

15           

20           

25           

30           

35           

40           

45           

50           

55           

60           

65           

70           

75           

80           

85           

90           

95           

100           

105           

110           

115           

120           

125           

130           

135           

140           

145           

150           

155           

160           

165           

170           

175           

180           

185           

190           

195           

200           

205           

210           

215           

220           

225           

230           

235           

240           

245           

250           

255           

260           

265           

270           

275           

280           

285           

290           

295           

300           

305           

310           

315           

320           

325           

330           

335           

340           

345           

350           

355           

360           

365           

370           

375           

380           

385           

390           

395           

400           

405           

410           

415           

420           

425           

430           

435           

440           

445           

450           

455           

460           

465           

470           

475           

480           

485           

490           

495           

500           

505           

510           

515           

520           

525           

530           

535           

540           

545           

550           

555           

560           

565           

570           

575           

580           

585           

590           

595           

600           

605           

610           

615           

620           

625           

630           

635           

640           

645           

650           

655           

660           

665           

670           

675           

680           

685           

690           

695           

700           

705           

710           

715           

720           

725           

730           

735           

740           

745           

750           

755           

760           

765           

770           

775           

780           

785           

790           

795           

800           

805           

810           

815           

820           

825           

830           

835           

840           

845           

850           

855           

860           

865           

870           

875           

880           

885           

890           

895           

900           

905           

910           

915           

920           

925           

930           

935           

940           

945           

950           

955           

960           

965           

970           

975           

980           

985           

990           

995           

1000           

1005           

1010           

1015           

1020           

1025           

1030           

1035           

1040           

1045           

1050           

1055           

1060           

1065           

1070           

1075           

1080           

1085           

1090           

1095           

1100           

1105           

1110           

1115           

1120           

1125           

1130           

1135           

1140           

1145           

1150           

1155           

1160           

1165           

1170           

1175           

1180           

1185           

1190           

1195           

1200           

1205           

1210           

1215           

1220           

1225           

1230           

1235           

1240           

1245           

1250           

1255           

1260           

1265           

1270           

1275           

1280           

1285           

1290           

1295           

1300           

1305           

1310           

1315           

1320           

1325           

1330           

1335           

1340           

1345           

1350           

1355           

1360           

1365           

1370           

1375           

1380           

1385           

1390           

1395           

1400           

1405           

1410           

1415           

1420           

1425           

1430           

1435           

1440           

1445           

1450           

1455           

1460           

1465           

1470           

1475           

1480           

1485           

1490           

1495           

1500           

1505           

1510           

1515           

1520           

1525           

1530           

1535           

1540           

1545           

1550           

1555           

1560           

1565           

1570           

1575           

1580           

1585           

1590           

1595           

1600           

1605           

1610           

1615           

1620           

1625           

1630           

1635           

1640           

1645           

1650           

1655           

1660           

1665           

1670           

1675           

1680           

1685           

1690           

1695           

1700           

1705           

1710           

1715           

1720           

1725           

1730           

1735           

1740           

1745           

1750           

1755           

1760           

1765           

1770           

1775           

1780           

1785           

1790           

1795           

1800           

1805           

1810           

1815           

1820           

1825           

1830           

1835           

1840           

1845           

1850           

1855           

1860           

1865           

1870           

1875           

1880           

1885           

1890           

1895           

1900           

1905           

1910           

1915           

1920           

1925           

1930           

1935           

1940           

1945           

1950           

1955           

1960           

1965           

1970           

1975           

1980           

1985           

1990           

1995           

2000           

2005           

2010           

2015           

2020           

2025           

2030           

2035           

2040           

2045           

2050           

2055           

2060           

2065           

2070           

2075           

2080           

2085           

2090           

2095           

2100           

2105           

2110           

2115           

2120           

2125           

2130           

2135           

2140           

2145           

2150           

2155           

2160           

2165           

2170           

2175           

2180           

2185           

2190           

2195           

2200           

2205           

2210           

2215           

2220           

2225           

2230           

2235           

2240           

2245           

2250           

2255           

2260           

2265           

2270           

2275           

2280           

2285           

2290           

2295           

2300           

2305           

2310           

2315           

2320           

2325           

2330           

2335           

2340           

2345           

2350           

2355           

2360           

2365           

2370           

2375           

2380           

2385           

2390           

2395           

2400           

2405           

2410           

2415           

2420           

2425           

2430           

2435           

2440           

2445           

2450           

2455           

2460           

2465           

2470           

2475           

2480           

2485           

2490           

2495           

2500           

2505           

2510           

2515           

2520           

2525           

2530           

2535           

2540           

2545           

2550           

2555           

2560           

2565           

2570           

2575           

2580           

2585           

2590           

2595           

2600           

2605           

2610           

2615           

2620           

2625           

2630           

2635           

2640           

2645           

2650           

2655           

2660           

2665           

2670           

2675           

2680           

2685           

2690           

2695           

2700           

2705           

2710           

2715           

2720           

2725           

2730           

2735           

2740           

2745           

2750           

2755           

2760           

2765           

2770           

2775           

2780           

2785           

2790           

2795           

2800           

2805           

2810           

2815           

2820           

2825           

2830           

2835           

2840           

2845           

2850           

2855           

2860           

2865           

2870           

2875           

2880           

2885           

2890           

2895           

2900           

2905           

2910           

2915           

2920           

2925           

2930           

2935           

2940           

2945           

2950           

2955           

2960           

2965           

2970           

2975           

2980           

2985           

2990           

2995           

3000           

3005           

3010           

3015           

3020           

3025           

3030           

3035           

3040           

3045           

3050           

3055           

3060           

3065           

3070           

3075           

3080           

3085           

3090           

3095           

3100           

3105           

3110           

3115           

3120           

3125           

3130           

3135           

3140           

3145           

3150           

3155           

3160           

3165           

3170           

3175           

3180           

3185           

3190           

3195           

3200           

3205           

3210           

3215           

3220           

3225           

3230           

3235           

3240           

3245           

3250           

3255           

3260           

3265           

3270           

3275           

3280           

3285           

3290           

3295           

3300           

3305           

3310           

3315           

3320           

3325           

3330           

3335           

3340           

3345           

3350           

3355           

3360           

3365           

3370           

3375           

3380           

3385           

3390           

3395           

3400           

3405           

3410           

3415           

3420           

3425           

3430           

3435           

3440           

3445           

3450           

3455           

3460           

3465           

3470           

3475           

3480           

3485           

3490           

3495           

3500           

3505           

3510           

3515           

3520           

3525           

3530           

3535           

3540           

3545           

3550           

3555           

3560           

3565           

3570           

3575           

3580           

3585           

3590           

3595           

3600           

3605           

3610           

3615           

3620           

3625           

3630           

3635           

3640           

3645           

3650           

3655           

3660           

3665           

3670           

3675           

3680           

3685           

3690           

3695           

3700           

3705           

3710           

3715           

3720           

3725           

3730           

3735           

3740           

3745           

3750           

3755           

3760           

3765           

3770           

3775           

3780           

3785           

3790           

3795           

3800           

3805           

3810           

3815           

3820           

3825           

3830           

3835           

3840           

3845           

3850           

3855           

3860           

3865           

3870           

3875           

3880           

3885           

3890           

3895           

3900           

3905           

3910           

3915           

3920           

3925           

3930           

3935           

3940           

3945           

3950           

3955           

3960           

3965           

3970           

3975           

3980           

3985           

3990           

3995           

4000           

4005           

4010           

4015           

4020           

4025           

4030           

4035           

4040           

4045           

4050           

4055           

4060           

4065           

4070           

4075           

4080           

4085           

4090           

4095           

4100           

4105           

4110           

4115           

4120           

4125           

4130           

4135           

4140           

4145           

4150           

4155           

4160           

4165           

4170           

4175           

4180           

4185           

4190           

4195           

4200           

4205           

4210           

4215           

4220           

4225           

4230           

4235           

4240           

4245           

4250           

4255           

4260           

4265           

4270           

4275           

4280           

4285           

4290           

4295           

4300           

4305           

4310           

4315           

4320           

4325           

4330           

4335           

4340           

4345           

4350           

4355           

4360           

4365           

4370           

4375           

4380           

4385           

4390           

4395           

4400           

4405           

4410           

4415           

4420           

4425           

4430           

4435           

4440           

4445           

4450           

4455           

4460           

4465           

4470           

4475           

4480           

4485           

4490           

4495           

4500           

4505           

4510           

4515           

4520           

4525           

4530           

4535           

4540           

4545           

4550           

4555           

4560           

4565           

4570           

4575           

4580           

4585           

4590           

4595           

4600           

4605           

4610           

4615           

4620           

4625           

4630           

4635           

4640           

4645           

4650           

4655           

4660           

4665           

4670           

4675           

4680           

4685           

4690           

4695           

4700           

4705           

4710           

<

kinetic friction when pushed along the existing surface i.e., the unfaced existing attic insulation. This is particularly true at the edges of the attic space where the roof slope meets the attic floor. The amount of 5 friction between two mineral batts is considerable, and it is not easy to slide the reinsulation batt along the surface of existing batts in the attic space.

Another problem associated with reinsulating residential attic spaces is that the existing and new 10 insulation materials generate significant quantities of dust, which are irritating to the installers. Typically, reinsulation is accomplished as a do-it-yourself project by residential homeowners. It would be beneficial if batts for reinsulating attic spaces were made to be easily 15 slid in place over existing insulation in the attic. Further, it would be beneficial to provide some means for containing dust associated with the batts used for reinsulation.

Encapsulated insulation packages are known in the 20 art. McLaughlin, in U.S. Patent 2,113,068 and Parker, in U.S. Patent 2,913,104, each disclose insulation packages in which mineral wool is covered by a wrapper.

Facings of different materials have been proposed for insulation batts. These include kraft paper, and 25 polyethylene films, as disclosed in U.S. Patent 4,696,138 to Bullock. Bullock teaches a vapor-permeable polyethylene facing on four sides of a batt. The purpose of Bullock's facing is to stop convection from occurring in glass fiber insulation products.

30 Syme in U.S. Patent 4,927,705 discloses an insulation product covered with a vapor barrier of 1.02E-5 - 2.03E-5 meters (1 to 2 mil) polyethylene. This product is completely encapsulated, and there is no porosity for

passing moisture or for enabling compression during packaging. The ability to compress the insulation batt for packaging and have the insulation batt recover to a reasonable thickness once the package is opened for installation in the attic is a product requirement.

5 A very important aspect of any insulation product for retrofit situations is that the product must be nonflammable, i.e., it must pass the ASTM E84 flame spread test with a flame spread rating of 25 or less. One of the  
10 problems associated with some of the encapsulated mineral fiber insulation batts of the prior art is that the adhesive used to adhere the facing to the batt would itself contribute to a flammability problem. The adhesive prevents the product from passing the flame spread test  
15 with a flame spread rating of 25 or less. Such products invariably require expensive fire retardants to pass the test. Another problem with encapsulated insulation batts proposed to date is that the encapsulation materials prohibitively increase the cost of the insulation batt.

20 In view of the above, it would be desirable to provide an encapsulated mineral fiber insulation batt that has a thin facing, low coefficient of sliding friction over existing insulation in the attic, means to adhere the facing to the batt for handleability without using  
25 expensive fire retardants and without failing the ASTM flame spread test. Also, the insulation product should be at least in part highly porous to enable the rapid compression of the batt for packaging, and the batt must be capable of nearly full recovery upon the opening of the  
30 package. It is to be understood that although the product of the invention is designed for retrofit insulation in a residential attic, the product can also be used in other insulation applications such as insulating wall cavities,

-4-

basement ceilings, residential new construction, and insulation for commercial buildings.

DISCLOSURE OF THE INVENTION

There has now been developed a compressible mineral fiber insulation batt having a very thin facing (less than 1.02E-5 meters (1 mil) in thickness) adhered to the two major faces of batt, where the facing is of sufficiently low mass as to exhibit a flame spread rating of 25 or less in the adhered condition and in the absence of fire retardants, and where the batt is capable of recovering to a predetermined thickness after release from compression to one-fourth of the predetermined thickness. It has been found that by using a very thin facing material, the product can pass the ASTM flame spread test, even when the facing is adhered to the mineral fiber batt with an adhesive.

In one embodiment of the invention the facing is vapor permeable.

In another embodiment of the invention, at least one of the opposed side surfaces of the batt is either uncovered, or covered with a highly porous membrane, to enable quick air escape from the batt under conditions of rapid compression.

The facing material is less than or equal to 1.02E-5 meters (1 mil) in thickness, preferably less than or equal to 6.10E-6 meters (0.6 mil) in thickness, and most probably less than or equal to 4.06E-6 meters (0.4 mil) in thickness.

One of the valuable features of the fiber insulation batt of the invention is that the coefficient of kinetic friction of the faced batt is less than one when the faced batt is dragged across a surface of an unfaced glass fiber batt having a density of about 8.01-

12.81 Kg/M<sup>3</sup> (0.5 to about 0.8 pounds per cubic foot). This low coefficient of kinetic friction enables the do-it-yourself attic installation installer to push or slide the batt of the invention across the top of existing insulation in the attic, thereby facilitating easy installation of the retrofit batts into the farthest reaches of an attic.

5 The polymeric facing is adhered to both major surfaces of the batt with a fastening means. Preferably 10 the fastening means is a small amount of adhesive material. The adhesive material is of a sufficiently small amount as to enable the insulation batt not to exceed a flame spread rating of 25 by the ASTM E84 flame spread test, while being sufficient to bond the facing to 15 the mineral fiber batt and enable the batt to be picked up and handled by the facing.

10 In another particular embodiment of the polymeric facing is adhered to one or both of the opposed side surfaces of the batt. In this embodiment the facing 20 is not necessarily adhered to either of the major surfaces.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a mineral fiber insulation batt having a facing material on the major 25 surfaces.

Figure 2 is a mineral fiber insulation batt having facing material on both the major surfaces and on the side surface.

30 Figure 3 is a schematic view of apparatus used in a test to evaluate the coefficient of kinetic friction of faced insulation batts.

#### BEST MODE FOR CARRYING OUT THE INVENTION

This invention will be described in terms of a

glass fiber insulation batt. It is to be understood that the mineral fiber insulation batt can be comprised of other types of mineral fibers, including fibers made from rock, slag and basalt.

5 Referring to Figure 1, insulation batt 10 is generally rectangular and has major surfaces 12, side surfaces 14, and end surfaces 16. Attached to the major surfaces is an encapsulation material or polymeric facing material 18. This material can be anything suitable to 10 contain the dust and provide a low kinetic friction surface. Preferably the material is a polymeric material, and most preferably it is a polyethylene. A specific polyethylene material found to be useful is a high density, high molecular weight polyethylene.

15 In other embodiments of the invention the facing is comprised of polypropylene. A preferred polypropylene facing is a biaxially oriented polypropylene.

20 The facing on the major surfaces can be vapor permeable or vapor impermeable. A vapor impermeable membrane can be rendered vapor permeable by means of 25 perforating the facing material.

The facing material is less than or equal to 1.02E-5 meters (1.0 mil) in thickness, preferably less than or equal to 6.10E-6 meters (0.6 mil) in thickness, 25 and most preferably less than or equal to 4.06E-6 meters (0.4 mil) in thickness. The facing material must be sufficiently thin to avoid high material costs and to minimize fuel contributed during fire testing.

30 The facing material is attached to the major surfaces of the batt by any suitable fastening means, such as adhesive 20. The fastening means could also be, for example, velcro attachment means, sticking or a heat sealing process. A suitable adhesive is a pressure

sensitive hot melt, such as HL-2707 from H.B. Fuller Company, applied at a rate of 2.15E+0 Gm/M<sup>2</sup> (0.2 grams per square foot).

5 The fastening means must provide a bond between the facing and the mineral fiber batt sufficient to enable the batt to be handled by the facing material. Therefore, the fastening means acts to prevent relative movement between the facing and the batt.

10 The fastening means, particularly if it is an adhesive, must be of sufficiently low mass so as to not unduly increase the flame spread of the batt with the facing in the adhered condition. The flame spread test is the ASTM E84 test. The measurement under the ASTM E84 flame spread test must be taken with the facing material 15 in the adhered condition. Further, the mass of the facing material and the adhesive material is sufficiently low to pass the flame spread test with a flame spread rating of 25 or less in the absence of fire retardants. For purposes of this invention, the term "absence of fire 20 retardants" means that the material either actually contains no fire retardants, or contains fire retardants in such an insubstantial amount that the facing, in the adhered condition, would still pass the flame spread test with a flame spread rating of 25 or less if the fire 25 retardant were left out of the product. This provides a considerable enhancement over the art in terms of material costs since a fire retardant is not needed. The test consists of determining the extent to which flames travel along the product under specified conditions when the 30 product is exposed to a flame at one end.

As shown in Figure 1, the side surfaces are uncovered. This enables rapid compression of the batt during a packaging operation. Since most insulation batts

are highly compressed during packaging and transport, it is important for the air within the insulation package to be released rapidly during the compression process.

As shown in Figure 2, the insulation batt can be provided with side facing material 22. The side facing material can be any material to contain the dust within the insulation product, while still being sufficiently porous to enable the rapid evacuation of air from within the batt during compression. The most expedient facing material may be the same facing material used on the major surfaces, but being highly perforated. Alternatively, the facing material can be cut to produce flaps to enable air escape during compression, but present a rather solid-looking appearance under static conditions. Additional side facing materials useful for this invention would be any scrim or other open-weave material, woven or nonwoven, made from polymeric fibers or glass fibers. Preferably, the side facing material has openings in at least 10 percent of its surface during the compression process. In one embodiment of the invention, the side facing material 22, as well as the facing material 18, is adhered to the batt.

The addition of the facing material to what would normally be an unfaced batt, imparts a structure to the batt which enhances its handleability and installability in residential attics. Further, since the facing material covers the batt, any surface irregularities which would constitute a visual surface defect are covered up. Consequently, a certain amount of scrap or recycled glass fiber material may be added to the product without detracting from its visual appearance. Further, the mineral fiber insulation batt can be made with a lower amount of organic binder material than would otherwise be

the case. Preferably, the amount of binder material is within the range of from about 1 to about 7 percent by weight of the unfaced batt. Most preferably, the binder comprises between 1 and 4.6 percent by weight of the 5 unfaced batt. Such binders are well known to those skilled in the art.

One attribute of the facing material is that it must be sufficiently slippery to enable the batt to be pushed or slid into place on top of the existing attic 10 insulation material. Preferably, the coefficient of kinetic friction of the faced batt is less than 1.0, when the faced batt is pulled or dragged across a surface of an unfaced glass fiber batt having a density of about 8.01-12.81 Kg/M<sup>3</sup> (0.5 to about 0.8 pounds per cubic foot).

ASTM test D 2534-88 is a standard test method for 15 determining the coefficient of kinetic friction for wax coatings. A test dynamically similar to D 2534-88 was used to determine the coefficient of kinetic friction of various facing materials suitable for use with mineral 20 fiber insulation. A reference batt of R-13 glass fiber insulation was constructed. The reference batt has a density of about 11.21 Kg/M<sup>3</sup> (0.7 pounds per cubic foot) and measures 3.048 meters by 3.048 meters (one foot by one foot) by about 9.2 cm (3-5/8 inches). The reference batt 25 was faced on the top side and unfaced on the bottom. The batt was dragged at a speed of 50.8 cm (20 inches) per minute across the various surfaces to be tested in accordance with the general principles of ASTM D 2534-88, and the coefficient of kinetic friction was determined by 30 measuring the amount of frictional resistance encountered.

The apparatus used is shown in Fig. 3 in which reference batt 24 having facing 26 is pulled across the testing surface 28. The reference batt was pulled by

-10-

means of wire 30, which after being turned upwardly around roller 32, was connected to a force measuring device. Any device suitable for measuring the load on the wire, such as a force transducer or Instron load cell 34, could be used. The coefficient of kinetic friction is the measurement of the frictional force between the bottom surface of the reference batt and the top surface of the testing surface or facing material 28 to be tested.

EXAMPLE

10 The reference batt was dragged across five different materials according to the test procedure outlined above, with the following results.

	<u>Sample</u>	<u>Coefficient of Friction</u>
	Unperforated 4.06E-6 meters	
15	(0.4 mil) high density, high molecular weight polyethylene	0.826
	Perforated 4.06E-6 meters	
20	(0.4 mil) high density, high molecular weight polyethylene	0.735
	Kraft paper	0.186
	AC plywood	2.5
	Unfaced glass fiber batt	7.73
25	The above data show that the faced batt has a small fraction of the friction exhibited by the action of sliding one unfaced batt across the other. Preferably, the coefficient of kinetic friction is within the range of from about 0.7 to about 0.9, and most preferably it is anything less than or equal to 1.0.	
30	The fact that the side surfaces of the batt are highly porous not only enables rapid compression by allowing the escape of air during compression, but also	

-11-

facilitates the recovery of the product after the product is unpackaged in its place of intended use. Preferably, the batt is capable of recovering to a predetermined thickness after release from compression to one-fourth of that predetermined thickness. For example, if the desired nominal thickness of an R-19 glass fiber insulation batt is 15.24 cm (6 inches), the batt can be compressed to a thickness of 3.8 cm (1.5 inches), and upon release from the packaging material, the batt will self-recover to the thickness of 15.24 cm (6 inches). Most preferably, the batt is capable of recovering to a predetermined thickness after release from compression to one-sixth of that predetermined thickness.

It will be evident from the foregoing that various modifications can be made to this invention. Such, however, are considered as being within the scope of the invention.

INDUSTRIAL APPLICABILITY

The mineral fiber insulation batt of the invention can be used for additional insulation in the attic space of a residential dwelling which has already been insulated.

CLAIMS

1. A compressible mineral fiber insulation batt having opposed major surfaces and opposed side surfaces, and a polymeric facing applied to both of the major surfaces, the facing being adhered to the batt to prevent relative movement between the facing and the batt, the facing being less than or equal to 1.02E-5 meters (1 mil) in thickness, and the facing being of sufficiently low mass as to exhibit a flame spread rating of 25 or less in the adhered condition, and the batt being capable of recovering to a predetermined thickness after release from compression to one-fourth of said predetermined thickness.  
5
2. The batt of claim 1 in which the facing is vapor permeable.  
10
3. The batt of claim 2 in which the facing is adhered to at least one of the major surfaces.  
15
4. The batt of claim 3 in which the facing is of sufficiently low mass as to exhibit, on the major surface to which the facing is adhered, a flame spread of 25 or less in the adhered condition and in the absence of fire retardants.  
20
5. The batt of claim 4 in which the facing is comprised of high density, high molecular weight polyethylene.  
25
6. The batt of claim 2 in which the opposed side surfaces are covered with a highly porous membrane, to enable quick air escape from the batt under conditions of rapid compression.  
30
7. The batt of claim 6 in which the highly porous membrane is adhered to at least one of the side surfaces.
8. The batt of claim 7 in which the facing is less than or equal to 6.10E-6 meters (0.6 mil) in thickness.

-13-

thickness.

9. The batt of claim 8 in which the coefficient of kinetic friction of the faced batt is less than 1.0, when the faced batt is dragged across a surface of an  
5 unfaced glass fiber batt having a density of about 8.01-12.81 Kg/M<sup>3</sup> (0.5 to about 0.8 pounds per cubic foot).

10. The batt of claim 9 in which the facing has a thickness of less than or equal to 4.06E-6 meters (0.4 mil).

10

1/2

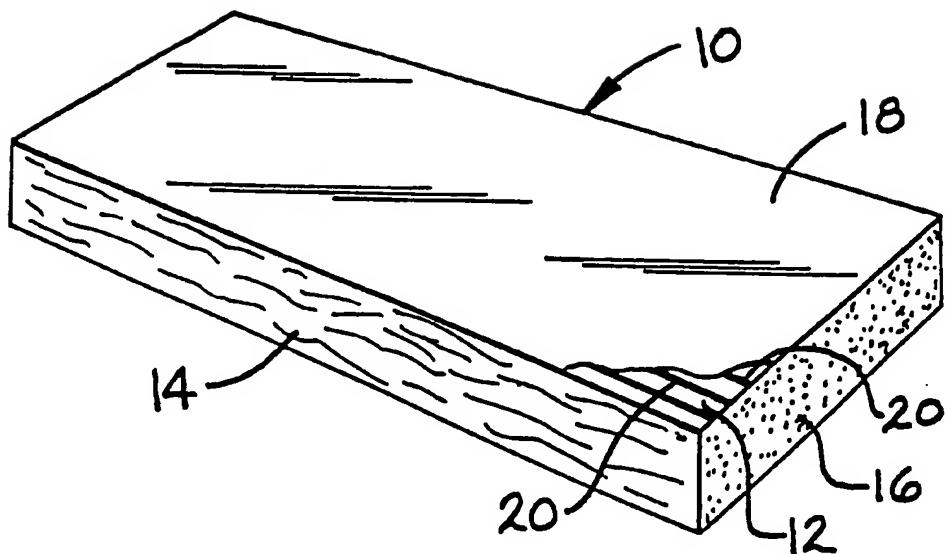


FIG.1

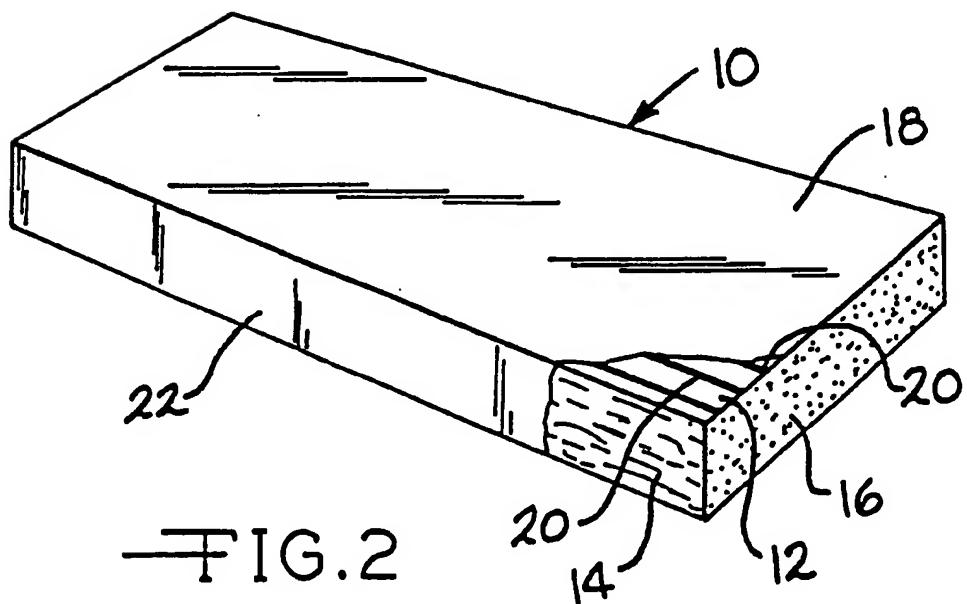
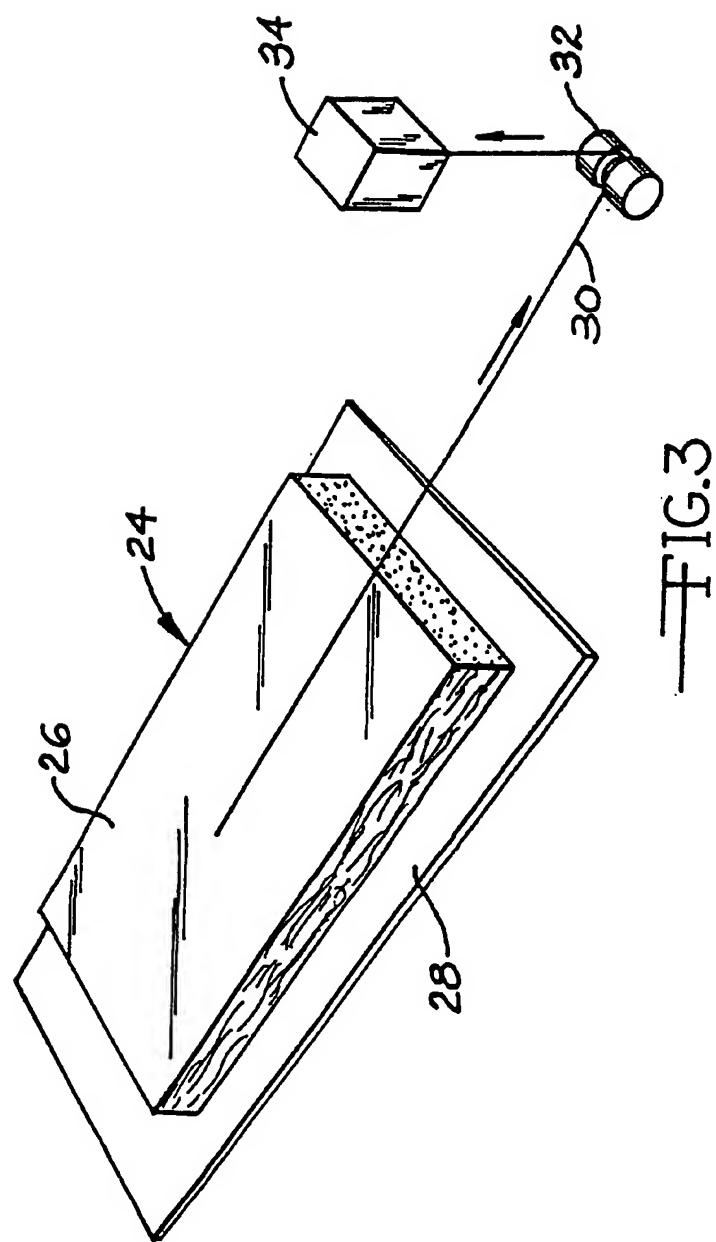


FIG.2



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 93/05328A. CLASSIFICATION OF SUBJECT MATTER  
IPC 5 E04B1/76 E04B1/78 E04C2/24

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 5 E04B E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,U,85 05 179 (SOCIETA ITALIANA VETRO-SIV S.P.A.) 23 May 1985 see the whole document ---	1-4
A	US,A,4 952 441 (A. K. BOSE ET AL.) 28 August 1990 see column 3, line 7 - column 4, line 30; figure 1 ---	1-4
A	FR,A,2 418 082 (ROCKWOOL INTERNATIONAL A/S) 21 September 1979 see the whole document ---	1
A	DE,B,12 50 767 (COMPAGNIE DE SAINT-GOBAIN) 21 September 1967 see the whole document ---	1-8
		-/-

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

## \* Special categories of cited documents :

- 'A' document defining the general state of the art which is not considered to be of particular relevance
- 'B' earlier document but published on or after the international filing date
- 'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- 'O' document referring to an oral disclosure, use, exhibition or other means
- 'P' document published prior to the international filing date but later than the priority date claimed

- 'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- 'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- 'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- '&' document member of the same patent family

1.

Date of the actual completion of the international search

8 February 1994

Date of mailing of the international search report

28-02-1994

Name and mailing address of the ISA  
European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Delzor, F

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 93/05328

## C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,1 500 317 (SOCIÉTÉ NOUVELLE SIPLAST) 3 November 1967 see the whole document -----	1-9
A	WO,A,91 17326 (W. LINDAL) 14 November 1991 see the whole document -----	1,2,6

1